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## EUROPEAN PATENT APPLICATION

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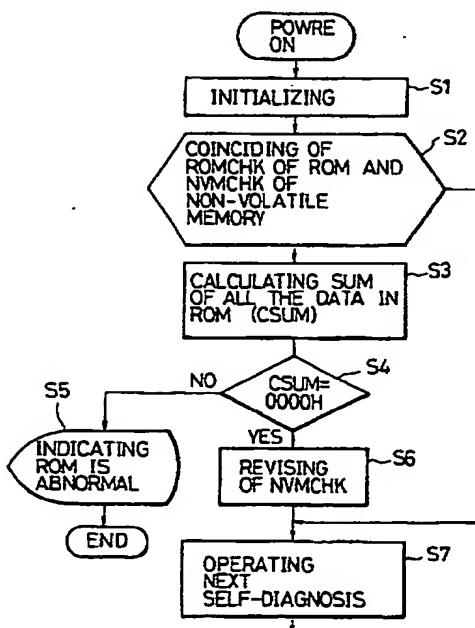
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④ Method of self-diagnosing a mobile telephone set for use in a mobile telephone switching system  
and mobile telephone set being applied to the method.

④ The present invention relates to a self-diagnosing method which shortens the diagnosing time for a ROM which is provided within a mobile telephone set for use in a mobile telephone switching system and mobile telephone set being applied the method. When the power supply is turned ON, a complementary value which complements to set up the sum of data stored within all the addresses of the ROM as a certain specific value, ROMCHK, which is the content of the data stored within a specific address of the ROM, is compared with NVMCHK which is the content of data stored previously within a specific address of a non-volatile memory with the same value as the ROMCHK. If they do not coincide, then the content of the data within the entire area of the ROM is calculated for the diagnosis. In this case, the content stored within the specific address of the ROM is the sum of the data values within the entire area of the ROM, and the content stored within the specific address of the non-volatile memory is the same as this sum value.

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FIG. 1



## BACKGROUND OF THE INVENTION

## 1. Field of the Invention

The present invention relates to a method of self-diagnosing a mobile telephone set for use in a mobile telephone switching system, and particularly to a method of self-diagnosing a read-only memory (hereinafter referred to as ROM) which is provided with the mobile telephone set.

## 2. Description of the Related Art

In mobile telephone sets, various self-diagnoses are carried out when the power supply is turned ON, and the reliability of mobile telephone sets is improved by preventing use unless the mobile telephone sets are determined to be normal as a result of self-diagnoses. The self-diagnoses, include a diagnosis for a ROM provided within the telephone sets, which must be carried out without fail. In this case, the contents of all the addresses of the ROM are read out to carry out operations such as summing up or logic calculus exclusive OR. If each operational result turns out to be a value calculated previously, then a content of the ROM is determined to be normal, while, if not, then it is determined that something abnormal exists within the content of the ROM and the user is informed of that fact.

Incidentally, in recent mobile telephone sets, as the program size of the man-machine interface portion has been increased in order to achieve various functions, the capacity of ROM has been correspondingly increased from 512 kbits to 1 Mbit. As a result, there has arisen a problem in that it takes a long time for diagnosis if, each time the power supply is turned ON, the contents of all the addresses of ROM is read out for operation and the result of this operation is compared with a specific value to diagnose the ROM. For example, if a typical eight-bit microprocessor (hereinafter referred to as a CPU) takes about 1 to 2 seconds for the diagnosis, it takes about 1 to 2 seconds until the telephone set becomes operable after the power supply is turned ON, which irritates the user and results in a serious problem to impaire the reputation of the mobile telephone switching system. In addition, also for the manufacturer, since the telephone set cannot be tested for about 1 to 2 seconds after the power supply is turned ON, the number of man-hours required for inspection is increased thereby resulting in an increase in manufacturing cost.

## SUMMARY OF THE INVENTION

Accordingly, an object of the present invention

is to provide a method of shortening the self-diagnosing time of a mobile telephone set.

Further, another object of the present invention is to provide a method of self-diagnosing to make the mobile telephone set available for use immediately after the power supply is turned ON.

Still another object of the present invention is to provide a method of self-diagnosing to make the mobile telephone set available for inspection immediately after the power supply is turned ON at the inspection stage during manufacture.

In order to achieve the objects described above, the self-diagnosing method of the present invention comprises steps to compare the content of the data stored within a specific address of the ROM with that stored within a specific address of a non-volatile memory when the power supply is turned ON, to determine whether the ROM is normal or not by comparing whether the two contents of data coincide with each other and calculates the data stored within all the addresses of the ROM according to the predetermined calculus to compare its result with the data stored within the non-volatile memory when the two contents of the data do not coincide. The content of the data stored within the specific address of the ROM may be the sum of the data stored within all the areas of the ROM, the value to complement the sum as a certain specific value, the result of the exclusive logical OR of the data stored within all the addresses of the ROM or the sum of the cyclic redundancy codes for each data within all the addresses of the ROM.

The above and other objects, features and advantages of the present invention will become apparent from the following description and the appended claims, taken in conjunction with the accompanying drawings.

Still further object of the invention is to provide a mobile telephone set having a method of shortening the self-diagnosing time.

In order to achieve the object described above, the mobile telephone set comprises first memory means having a plurality of memory locations in each of which data are to be stored, second memory means having a specific memory location in which data are to be stored, means for comparing first data stored in one of the plurality of memory locations with second data stored in the specific memory location, calculation means for making a calculation on all data stored in the plurality of memory locations when the first and second data do not coincide each other, to produce a calculation result, means for comparing calculation result with a predetermined value and means for indicating the first memory means to be abnormal when the calculation result differs from the predetermined value.

Further, the calculation means for making a calculation on all data stored in the plurality of memory locations may be means for summing all data stored in the plurality of memory locations to produce the sum of the all data as the calculation result, the first memory means may comprise a read only memory (ROM) and the second memory means may comprise a non-volatile memory in the mobile telephone set according to the invention described above.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a flowchart of a specific embodiment of a self-diagnosing method for the mobile telephone set according to the present invention; and

Fig. 2 is a block diagram of the mobile telephone set to which the self-diagnosing method according to the present invention shown in Fig. 1 is applied.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

A specific embodiment of the present invention is hereinafter described with reference to the accompanying drawings.

Fig. 2 is a block diagram of the essential portion of a mobile telephone set to which the self-diagnosing method according to the present invention shown in Fig. 1 is applied. This mobile telephone set comprises CPU 1, ROM 2 and non-volatile memory 3.

Any arbitrary content of ROM 2 can be written into any arbitrary address within non-volatile memory 3. CPU 1 determines whether the content of data stored within a specific address of ROM 2 and that of non-volatile memory 3 coincide by comparing them.

Based on this circuit arrangement, the diagnosing method according to the present invention is hereinafter described with reference to Fig. 1. At first, in step S1, the mobile telephone set is initialized. Next, in step S2, CPU 1 compares ROMCHK which is data stored within a specific address of ROM 2 with NVMCHK which is data stored within a specific address of the non-volatile memory 3. The value of ROMCHK is the complementary data provided to set up the sum of the values of the data of all the addresses of ROM 2 as a certain specific value, for example, 0000H, which is assigned at the stage of factory inspection, while NVMCHK is the same value as that described above, which is stored within non-volatile memory 3. In this case, the content of NVMCHK is previously written within the specific address of non-volatile memory 3. If both contents coincide, then ROM 2 is determined

to be normal, after which the self-diagnosis proceeds to the next self-diagnosing operation step S7. If they do not coincide, the operation proceeds to step S3 deciding that some change has been added to the content of ROM 2.

In step S3, the data values of all the addresses of ROM 2 are read out, and their sum is calculated as a checking sum (hereinafter referred to as CSUM). Step S4 is a process for determining whether the value of CSUM is equal to the value calculated and stored in another address of ROM 2 previously, for example, 00A0H and, if it is a value other than 00A0H, then it is determined that something abnormal exists in the content of ROM 2, and indicates to the user that ROM 2 is abnormal in step S5. On the other hand, if the value of CSUM is 00A0H, then it is determined that the content of ROM 2 is normal, and after revising the value of ROMCHK of ROM 2 and the value of NVMCHK of the non-volatile memory 3 in step 6, proceeds to carry out next self-diagnosing operation step 7. Incidentally, although in this embodiment, a complementary value which complements to set up the sum of the data of all the area of the ROM as a predetermined value is compared in order to determine the validity of the ROM, the value may be that sum per se, the exclusive logical OR of the data within all the addresses of ROM 2 or the sum of the cyclic redundancy codes of the data within all the addresses of ROM 2.

While certain representative embodiments have been described for the purpose of illustrating the invention, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit or scope of the invention.

#### Claims

1. A method of self-diagnosing a mobile telephone set for use in a mobile telephone switching system having a read only memory (ROM), a non-volatile memory and a microprocessor and a data, which content is the calculated result of all the data stored in the ROM according to a predetermined calculus, stored within the specific locations of the ROM and non-volatile memory comprising the steps of: comparing the content of the data stored within a specific address of said ROM with that of said non-volatile memory when the power supply is turned ON; proceeding calculation of all the data stored in said ROM according to said calculation when said contents of the data stored in the ROM and non-volatile memory do not coincide and indicating the abnormality of ROM when said calculated result differs from the content of the data stored in the non-

volatile memory.

2. The method of self-diagnosing a mobile telephone set described in Claim 1 wherein the content of the data stored within the specific address of said ROM is the sum of the data values stored within all the addresses of said ROM, and the content of the data stored within the specific address of said non-volatile memory is the same value as said sum. 5

3. The method of self-diagnosing a mobile telephone set described in Claim 1 wherein the content of the data stored within the specific address of said ROM is the exclusive OR of the data stored within all the addresses of said ROM, and the content of the data stored within the specific address of said non-volatile memory is the same value as said result of the exclusive OR. 10

4. The method of self-diagnosing a mobile telephone set described in Claim 1 wherein the content of the data stored within the specific address of the ROM is the sum of the cyclic redundancy codes of the data stored within all the addresses of said ROM, and the content of the data stored within the specific address of said non-volatile memory is the same value as said sum. 15

5. The method of self-diagnosing a mobile telephone set described in Claim 1 wherein the content of the data stored within the specific address of said ROM is a complementary value which complements to set up the sum of the data stored within all the addresses of said ROM as a certain specific value, and the content of the data stored within the specific address of said non-volatile memory is the same value as said complementary value. 20

6. An apparatus comprising:  
 first memory means having a plurality of memory locations in each of which data are to be stored;  
 second memory means having a specific memory location in which data are to be stored;  
 means for comparing first data stored in one of said plurality of memory locations with second data stored in said specific memory location; 25  
 calculation means for making a calculation on all data stored in said plurality of memory locations when said first and second data do not coincide each other, to produce a calculation result; 30

means for comparing calculation result with a predetermined value; and  
 means for indicating said first memory means to be abnormal when said calculation result differs from said predetermined value. 35

7. An apparatus as claimed in claim 6, wherein said calculation means comprises means for summing all data stored in said plurality of memory locations to produce the sum of all the data as said calculation result. 40

8. An apparatus as claimed in claim 6, wherein said first memory means comprises a read only memory (ROM), and wherein said second memory means comprises a non-volatile memory. 45

FIG. 1

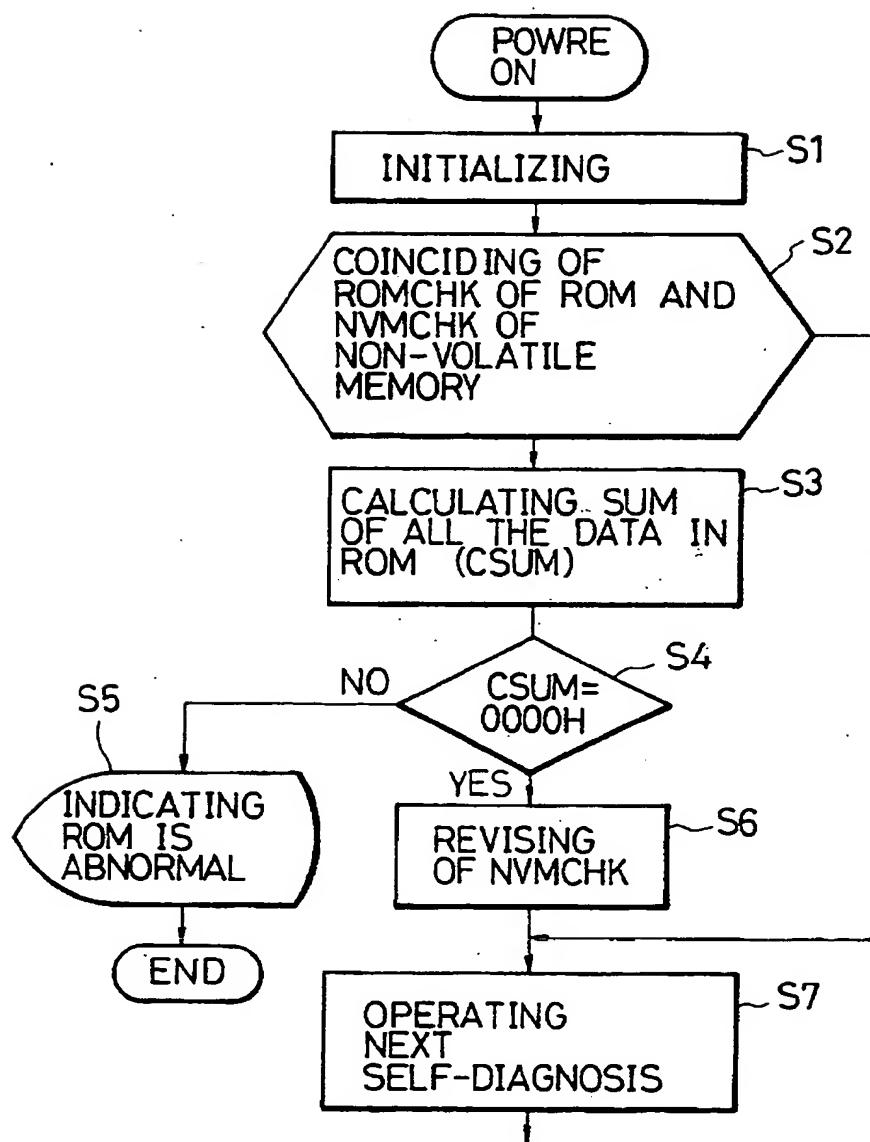
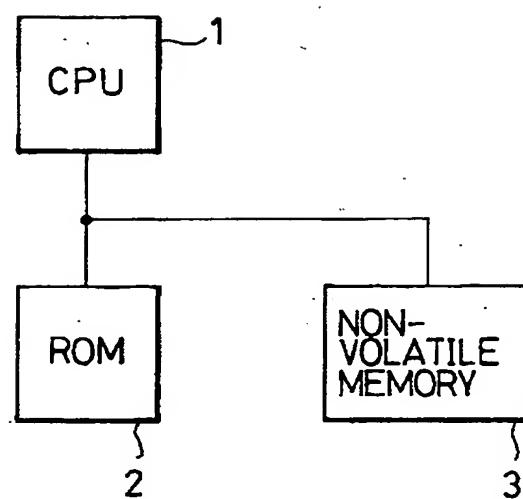


FIG.2





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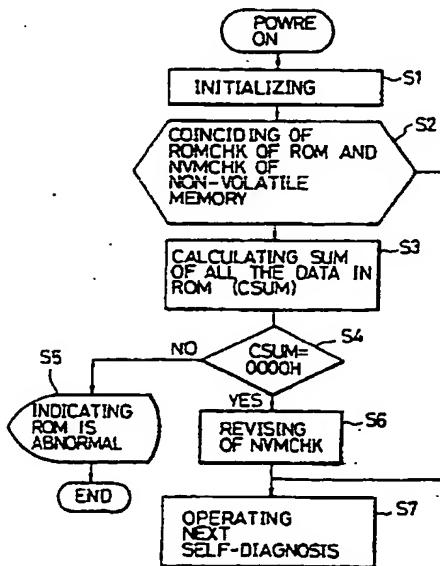
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㉑ Method of self-diagnosing a mobile telephone set for use in a mobile telephone switching system  
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FIG. 1





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EUROPEAN SEARCH REPORT

Application Number  
EP 92 30 4545

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.CLS)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	DE-A-31 05 254 (ROBERT BOSCH) * the whole document *	1,2	G06F11/08 G06F11/14 H04Q7/04 G11C29/00
A	US-A-4 354 251 (HELLWIG ET AL) * the whole document *	1,2	
A	EP-A-0 297 507 (INTERNATIONAL BUSINESS MACHINES) * the whole document *	1-3,6,8	
A	DE-A-37 09 524 (ROBERT BOSCH) * the whole document *	1	
A	EP-A-0 127 002 (THE BENDIX CORPORATION) * page 12, line 29 - page 14, line 34 *	1,2,6-8	
			TECHNICAL FIELDS SEARCHED (Int.CLS)
			G06F H04Q G11C
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	10 January 1994	Guivrol, Y	
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